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INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

REC'D 23 AUG 2005

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Applicant's or agent's file reference P18107-JOM	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/EP 03/05087	International filing date (<i>day/month/year</i>) 15.05.2003	Priority date (<i>day/month/year</i>) 15.05.2003
International Patent Classification (IPC) or both national classification and IPC H04L12/56		
Applicant TELEFONAKTIEBOLAGET LM ERICSSON (PUBL) et al.		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 8 sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the opinion</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>		
Date of submission of the demand 25.11.2004	Date of completion of this report 22.08.2005	
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Perez Perez, J Telephone No. +31 70 340-3774 	

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP 03/05087

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-4, 8-15	as originally filed
5, 7, 7a	received on 02.04.2005 with letter of 31.03.2005
6, 6a	received on 16.07.2005 with letter of 13.07.2005

Claims, Numbers

1-15	received on 16.07.2005 with letter of 13.07.2005
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Drawings, Sheets

1/3-3/3	as originally filed
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP 03/05087

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-15
	No: Claims	
Inventive step (IS)	Yes: Claims	1-15
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-15
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

- 1 The document US2002/0150041(Onetier Communications Inc.) is regarded as being the closest prior art to the subject-matter of claim 1. Said document discloses a method for data transportation over the Internet according to given quality of service conditions. For this purpose optimal paths are defined for delivering data from a source to a destination. The transportation of different application types may be split between plural optimal paths, optionally by using a weighted distribution scheme(see paragraphs [0041] and [0042] of said document). The control function of said split being located in the source endpoint(see paragraphs [0054] to [0056] of said document).

The subject-matter of claim 1 differs from the prior art in that the different network entities handling the plural connections, are made aware of the service level specification applicable to the connection. The different entities handling the connection will be controlled to ensure that the sum of the quality of service of said connections between the two communication partners does not exceed limits defined in the service level specification.

An advantageous effect of the subject-matter of claim 1, becomes clear when the distribution of the service level specification between network entities is done by way of partitioning or by way of replication.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT). Additionally, the contribution of claim 1 over the existing prior art is considered to involve an inventive step(Article 33(3) PCT).

- 2 Independent claims 9 and 13 represent the features of the corresponding edge node and bandwidth broker, respectively, necessary to carry out the invention. Therefore, claims 9 and 14 are also considered new and inventive(Article 33(2),(3) PCT).
- 3 Claims 2-8,10-12,14,15 are dependent on claims 1,9 or 13 and as such also meet the

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP 03/05087

requirements of the PCT with respect to novelty and inventive step.

router or a node that handles IP traffic and applies the actions according to policy decision point decisions. In general policy enforcement points send messages in the form of requests to the PDP, upon which the PDP replies with decisions.

Quality of service negotiation between two partners, e.g. customer and network provider or two network providers, is done via SLAs (Service Level Agreement)s. These SLAs spell out policy requirements for both partners. SLAs are specified in Service Level Specifications. A high level SLA is mapped to a detailed policy representation in order to be used by the different PDPs and PEPs. The IETF (Internet Engineering Task Force) internet draft "Service Level Specification Semantics, Parameters and negotiation requirements" of July 2000, discloses an example of an outline for the definition of a SLS format. Some examples of parameters in an SLS are scope, i.e. the domain to which the SLS applies, flow id, including the Differentiated Services Code Point, traffic conformance testing, that is specifying e.g. the token bucket parameters, excess treatment which specifies how to treat excess traffic, and performance guarantees which defines the service guarantees that the network offers to the corresponding packet stream. These are basically the quality of service parameters as discussed before (bandwidth, delay, jitter, and reliability).

For inter-domain traffic flows, the corresponding PDPs can negotiate the quality of service requirements, for example by means of the COPS protocol.

However, the described prior art mentioned so far is based on a centralised handling of quality of service requirements on connections between two communication partners. This can lead to a lack of operation reliability and flexibility.

WO 02/51052 A2 discloses a system and method for routing a media stream. Dynamic routers are provided within a network for receiving said media stream and for selecting one output path from a set of possible output paths based on network traffic conditions and on service level information associated with a media stream's source. A network management unit is provided to control or reconfigure said dynamic routers such that said set of possible output paths is changed in accordance with traffic conditions throughout the network. The dynamic router may simultaneously transmit the same packet on multiple data paths.

US 2003/0074443 A1 discloses a last mile quality of service broker LMQB for multiple access networks. The LMQB determines a user's presence in one or more available access networks and interfaces with wireless and wireline network quality of service QoS entities by periodically signalling them for resource and policy information. When the user requests a particular QoS, the LMQB assigns an access network that is appropriate for the requested QoS by negotiating with the network entities on behalf of the mobile user. Once the real-time traffic is routed through a particular part of the network the LMQB periodically updates its database to ensure it provides end-to-end quality of service. If the user decides to change QoS requirements in the midst of a session, the LMQB dynamically updates the database and re-allocates new resources and establishes a path that meets the requested quality of service. In case such a path is not available, the LMQB informs the user accordingly.

Document US 2002/0150041 discloses a method for an improved quality of service for data transportation over the Internet. For this purpose, optimal paths are defined for delivering data from a source to a destination. The optimal paths are defined according to tested transportation parameters. The transportation of different application types may be split between different optimal paths, optionally by using a weighted distribution of data between the paths. The control function for this split is part of the signal source.

Summary of the invention

It is the object of the present invention to provide a predefined quality of service between two communication partners with increased reliability and flexibility.

That object is solved by the method claimed new by claim 1. Said method provides a predefined quality of service between two communication partners, and is characterized in that the two communication partners are connected by at least two connections, a first connection handled by a first network entity and a second connection handled by a second network entity, and wherein the method comprises the steps of: receiving or defining a service level agreement in a service level specification, distributing the service level specification to the first and the second network entity by means of partitioning or by means of replication;

6a

and controlling the first and the second network entity and thus ensuring that the sum of the provided quality of service on said connections between the two communication partners does not exceed limits defined in the service level specification.

A communication partner can be for example a client, a server, a domain, an operator, a node, a network or a computing device.

Advantageous is the plurality of connections and the distribution of the controlling. This avoids bottlenecks in connecting the two communication partners.

In an embodiment of the invention, the step of controlling is performed by a control node that is connected to the first and the second network entity.

In a further embodiment of the invention, the network entity is connected to and can be controlled by more than one control node and one control node controls more than one network entity. This has the advantage of further increasing the reliability of service provision.

In case of partitioning the first network entity handles a first kind of service requests and the second network entity handles a second kind of service requests. This is advantageous as not each node has to be adapted to provide all services and thus decreases investments into the network.

In case of replication each of the first and the second network entities handles up to a certain share of the quality of service permitted by the service level agreement. The advantage of this embodiment is that any entity can handle any service and thus flexibility of the network is increased.

In an embodiment of the invention, the network entity is an edge node. For said embodiment a control node can be a bandwidth broker. For said embodiment, the bandwidth broker can communicate to edge nodes by using multicasting. Multicasting is a very efficient way of addressing a plurality of receivers.

Further advantageous embodiments of the method can be derived from the dependent method claims.

The above identified object of the invention is further solved by an edge node according to claim 9.

7a

The input output unit of the edge node may be further adapted to receive information from further edge nodes providing a further connection between the communication partners and its control unit can be adapted to process the information according to instructions received from a bandwidth broker.

The control unit of the edge node can be adapted to control the quality of service of a connection according to instructions received from a further bandwidth broker and the input output unit can be adapted to receive said instructions.

The edge node can further comprise a charging unit for collecting charging information related to a connection.

Finally, the object of the invention is solved by a bandwidth broker according to claim 13.

New Claims

1. Method for providing a predefined quality of service between two communication partners, wherein the two communication partners are connected by at least two connections, a first connection handled by a first network entity and a second connection handled by a second network entity, and wherein the method is **characterized in that** it comprises the steps of:
receiving or defining a service level agreement in a service level specification,
distributing the service level specification to the first and the second network entity by means of partitioning or by means of replication; and
controlling the first and the second network entity and thus ensuring that the sum of the provided quality of service on said connections between the two communication partners does not exceed limits defined in the service level specification.
2. Method according to claim 1, wherein the step of controlling is performed by a control node that is connected to the first and the second network entity.
3. Method according to any of the preceding claims, wherein at least one of said first and second network entities is connected to and adapted to be controlled by more than one control node and the control node can control more than one network entity.
4. Method according to any of the preceding claims, wherein in case of partitioning the first network entity handles a first kind of service requests and the second network entity handles a second kind of service requests.
5. Method according to any of the claims 1 to 3, wherein in case of replication each of the first and the second network entities handles up to a certain share of the quality of service permitted by the service level agreement.
6. Method according to any of the preceding claims, wherein a network entity is an edge node (ER1, ER2, ER3).
7. Method according to any of the preceding claims, wherein a control node is a bandwidth broker (BB1, BB2, BB3).
8. Method according to claim 7, wherein the bandwidth broker (BB1, BB2, BB3) communicates to edge nodes (ER1, ER2, ER3) by using multicasting.
9. Edge node (EN31) for providing a connection with a predefined quality of service between two communication partners, comprising
a control unit (PU31) for controlling the quality of service of the connection according

to instructions received from a bandwidth broker (BB41),
a storage (STO31) for storing said instructions, and
an input output unit (IOU31) for providing the connection and receiving said
instructions;

characterized in that

the instructions received from the bandwidth broker (BB41) represent a partitioned or
replicated service level specification; and

the edge node (EN31) is enabled to control the quality of service on said connection
based on said received partitioned or replicated service level specification for
ensuring that the sum of the provided quality of service on said connections between
the two communication partners does not exceed limits defined in the service level
specification.

10. Edge node (EN31) according to claim 9, wherein the input output unit (IOU31) is
further adapted to receive information from further edge nodes providing a further
connection between the communication partners and wherein the control unit (PU31)
is adapted to process the information according to instructions (SLS) received from a
bandwidth broker (BB41).
11. Edge node (EN31) according to any of the claims 9 or 10, wherein the control unit
(PU31) is adapted to control the quality of service of the connection according to
instructions received from a further bandwidth broker and the input output unit
(IOU31) is adapted to receive said instructions.
12. Edge node (EN31) according to any of the claims 9 to 11, further comprising a
charging unit (CU31) for collecting charging information related to the connection.
13. Bandwidth broker (BB41) of a network
characterized in that
the bandwidth broker is embodied to provide a quality of service on at least two
connections between two communication partners according to a service level
agreement defined in at least one service specification; and
the bandwidth broker comprises:
a storage (STO41) for storing the service specification;
an input output unit (IOU41) for distributing the service level specification to a first and
a second network entity handling said at least two connections; and
a control unit (PU41) adapted to control said network entities to ensure that the
quality of service provided on the connections does not exceed limits defined in the
service specification.

14. Bandwidth broker (BB41) according to claim 13, wherein the control unit (PU41) is adapted to communicate with a further bandwidth broker and to negotiate the service level agreement with said further bandwidth broker.
15. Bandwidth broker (BB41) according to claim 13 or 14, wherein the input output unit (IOU41) is adapted to communicate with said network entities, representing edge nodes by means of multicasting.